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ROSE HIPS--A POSSIBLE HIGH-ENERGY FOOD FOR WINTERING MULE DEER?

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ABSTRACT

Mule deer wintering in northern Utah consumed hips from Woods and sweetbrier roses in Cache Valley. Except for about 1 cm of the hip's petiole, little of the woody portion was eaten. Rose hips appear to be a good source of digestible energy because the content of nitrogen-free extract is high (60.3 percent) and lignin (9.7 percent) and crude fiber (24.0 percent) content are low. Therefore, digestible energy level of browse on certain mule deer winter ranges could be raised by planting superior hip-yielding roses.

KEYWORDS: browse plants, nutrition, mule deer, winter range, rose hips

During the winter months, mule deer in Cache County, Utah, are driven by deep snows from high mountain ranges onto the foothills. There, they are forced to feed on rangelands that were grazed in the summer by livestock. With the grass gone, only woody shrubs are available. Short (1966) reports that the lack of sufficient levels of digestible energy is the most common nutritional deficiency of wintering deer. Smith and others (1975), Cook (1972), Nagy and Wallmo (1971), Hall (1970), and Dietz (1965) agree that shrubs are poor sources of digestible energy. This is due to the high cellulose and lignin content of shrubs.

Conservation of grasses on areas that are free of snow most of the winter, culture of high energy-yielding woody species, or both (Nagy and Wallmo 1971), may raise the digestible energy levels of mule deer winter ranges. Dietz (1965) suggests that woody species that retain their leaves, fruits, or both, throughout the winter are higher in nutritive value than those that lose such parts. Wild rose is a woody species that retains its fruit throughout the winter. Therefore, we undertook this study to determine (1) if mule deer consume rose hips, and (2) the digestible energy level of rose hips through chemical analyses. Because lignin is indigestible and deer can digest only limited amounts of crude fiber (Morrison 1961; Hall 1970; Nagy and Wallmo 1971; and Short 1963, 1966), a low lignin (12 percent or less) and crude fiber (25 percent or less) content, with a high level of nitrogen-free extract (55 percent or more), would be evidence that rose hips are high in digestible energy. Nitrogen-free extract contains the carbohydrates, such as sugars, starch, pectic substances, and others that supply digestible energy to the consuming animals (Morrison 1961). Unfortunately, indigestible lignin appears in this fraction.

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STUDY SITES

Two study sites were selected. Site A was chosen to study rose hip consumption by wintering mule deer. The previous winter (1973-74), we found signs that led us to believe mule deer had eaten rose hips in this area. Although we felt strongly that deer had eaten the hips, we could not rule out the possibility that small wildlife, such as birds, could have eaten the hips before the arrival of deer. Therefore, site B was chosen to study rose hip consumption by small wildlife.

Site A

Site A is 4.0 km south and 0.8 km east of Richmond, Utah, on a game winter range. The site, about 4 ha of rangeland, is almost completely surrounded by agricultural lands. Three major shrub communities occur on the site, big sagebrush (*Artemisia tridentata*), antelope bitterbrush (*Purshia tridentata*), and Woods rose (*Rosa woodsii ultramontana*). Using the field technique of Stevens and McArthur (1974), we determined that the big sagebrush was subspecies *vaseyana*. These shrubs generally grow in distinct communities with limited intermingling. Other woody species scattered throughout the site are black chokecherry (*Prunus virginiana melanocarpa*); bigtooth maple (*Acer grandidentatum*); boxelder (*Acer negundo*); river hawthorn (*Crataegus rivularis*); and sweetbrier rose (*Rosa eglanteria*).

Prior to plot establishment the summer of 1974, the site was grazed by the landowner's livestock from July to October. Woods rose was the only woody species grazed. Fortunately, in some places, this species had not been grazed, so we were able to establish grazed and ungrazed plots.

Site B

Site B is 3.2 km north and 1.6 km east of Richmond, Utah. This 0.2-ha site is on the flood plain (creek bottom) of High Creek. Major woody species within the site are black cottonwood (*Populus trichocarpa*), Woods rose, peachleaf willow (*Salix amygdaloides*), and boxelder. Of these, only Woods rose makes up a distinct community; the others are scattered throughout the site.

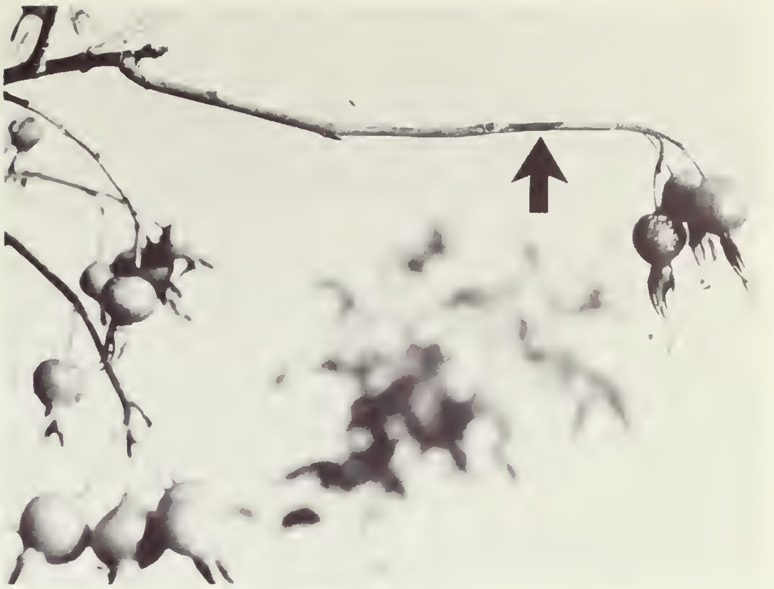
METHODS

Site A

On Site A two types of plots were established in October 1974: (1) Two 2 by 0.5 m rectangular plots, and (2) a trail plot through a stand of Woods rose (0.6 m wide).

One of the rectangular plots had been grazed by livestock in the summer. The other had not. On the grazed plot 13 Woods rose without hips and seven with hips were selected. The hipless rose plant would be used to determine whether or not mule deer

Figure 1.--Arrow points to black mark placed 2.54 cm from tip to rose hips. This mark was used to determine amount of rose stem eaten by mule deer.



browse hipless rose. For the ungrazed plot, 13 hipped and one hipless Woods rose were selected. All selected plants were tagged and the following data collected: number of hips, distance from stem tip or hip to nearest prickle, and number of prickles along the basal 2.54 cm. A waterproof black mark was placed 2.54 cm from hip or stem tips (fig. 1). This mark would be used to determine how much of the woody stem is browsed by deer.

The trail plot ran through a patch of heavily grazed Woods rose and alongside a clump of seven tall (1.5 to 1.8 m) plants bearing a large crop of hips. Two plants were selected and data collected as described. Thirteen hipless and eight hipped plants were selected at random along the trail.

Rose hips on a sweetbrier rose plant were counted as a basis for estimating subsequent hip consumption, if any, by deer.

In summary, we selected 30 Woods rose plants having rose hips and 27 hipless for studying deer use of rose plants; and one sweetbrier rose plant with hips.

All rose plants having hips were checked for loss or consumption of hips once a week starting December 6, 1974, and ending February 18, 1975. Hips on the ground or in the snow were counted and removed after each inspection.

Site B

An ungrazed 2 by 0.5 m plot of Woods rose was established. Because of the plot's accessibility, it was visited twice a week from December 6, 1974, to February 18, 1975. All signs of animal activity in or around the plot were recorded.

On January 10, 1975, the hips from nine Woods rose plants from the plot were harvested. Hips from the nine plants were pooled together and stored in a plastic bag (-5° C) for chemical analysis. The usual chemical means (Association of Official Agricultural Chemists 1965) were used to determine ash, kjeldahl nitrogen, calcium, phosphorus, crude fiber, crude fat, and nitrogen-free extract. Acid-detergent fiber and lignin determinations were made by following the technique of Van Soest (1963). Lignin, crude fiber, and nitrogen-free extract contents were needed to judge the potential digestible energy level of rose hips; the remaining chemical constituents were included so that comparisons with other woody species could be made.

RESULTS

Deer were first sighted January 1, 1975, by a farmer on Site A. Two days later we inspected the plants. Deer had already eaten 92 percent of the rose hips on selected plants (table 1). All sweetbrier roses had deer tracks leading to and around them. Freshly cut stem tips showed that deer had eaten the hips from these bushes.

Vasey big sagebrush showed signs of being heavily browsed by deer. It was clear that deer preferred rose hips and sagebrush as browse. Black chokecherry and antelope bitterbrush were not heavily browsed for another month.

Because of the deep snow and the proximity of a busy paved road to the Site B plot, we had not expected deer to move into the area; so results of the February 18, 1975, inspection came as a surprise. Mule deer had eaten over 90 percent of the rose hips. We found no evidence that other animals were eating rose hips previous to this inspection.

A careful inspection (March 28, 1975) of hipless Woods rose plants on Site A indicated deer had consumed less than 1 percent of the woody portions on rose plants without hips. The deer were eating the hips and about 1 cm of the hip's petiole.

Rose hips were lower in crude fiber (24.0 percent), protein (6.1 percent), lignin (9.7 percent), phosphorus (0.13 percent), and ash (3.6 percent) than big sagebrush and alfalfa (table 2). Hips were higher in nitrogen-free extract (60.3 percent) than big sagebrush (43.7 percent) and alfalfa (40.6 percent).

Woods rose varied greatly in prickliness. The average distance from hip or stem tip to first prickle was 17.3 cm with a standard deviation of ± 14.7 cm for 57 rose plants. Prickliness did not affect utilization or selectivity of hips by mule deer. Even the numerous large prickles of sweetbrier rose did not keep deer from eating hips.

The loss of Woods rose hips to summer livestock grazing was striking. In the grazed plots, the number of hips per plant was 2.5; on the ungrazed plots, the per plant yield was 15.

Table 1.--*Number of hips on Woods rose and sweetbrier rose plant before and after browsing by deer, Site A.*

	No. of hips on plants 12/6/74	No. of hips on plants 1/3/75	No. of hips in snow 1/3/75	Consumed by deer
				Percent
Woods rose (30 plants)	413	25	8	92
Sweetbrier Rose (1 plant)	357	13	12	92
Total	770	38	20	92

Table 2.--*Comparisons of the chemical composition of Woods rose hips (data from this study), big sagebrush,*[1] *and alfalfa*[1]

	Protein	Cell.	Lignin	Crude Fiber	Crude Fat	ADF[2]	Ash	Cal.	Phos.	NFE[3]	TDN[4]
					Percent						
Rose hips	6.1	--	9.7	24.0	6.0	23.3	3.6	0.75	0.13	60.3	--
Big sagebrush	9.4	21	16.0	[5]24.8	10.1	--	6.1	.67	.18	[5]43.7	51
Alfalfa	17.1	30	11.3	30.1	2.0	[6]29.8	8.5	1.35	.22	[5]40.6	57

[1] National Academy of Sciences (1964).
[2] ADF = Acid-detergent fiber
[3] NFE = Nitrogen-free extract
[4] TDN = Total digestible nutrients
[5] Morrison, F. B. (1961). Percentages converted to dry matter basis.
[6] Schwartz, C. C., and J. G. Nagy (1974).

CONCLUSIONS

Mule deer prefer rose hips over black chokecherry and antelope bitterbrush but not Vasey big sagebrush. Rose hips may be a high source of digestible energy. We base this conclusion on low lignin and crude fiber content accompanied by a high content of nitrogen-free extract. Therefore, digestible energy levels in the diet of deer might be increased by planting rose stock that produces heavy crops of hips (Blauer and others 1975).

Summer grazing of Woods rose by livestock greatly reduced the number of hips available to wintering deer. However, livestock did not graze sweetbrier rose--possibly due to the presence of large, heavy prickles. On winter ranges subjected to livestock grazing, sweetbrier rose may furnish more deer feed than Woods rose.

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